



# Thermo Scientific Orion

## 2395 Phosphate Analyzer

270118-001 • Revision B • August 2015



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# 1

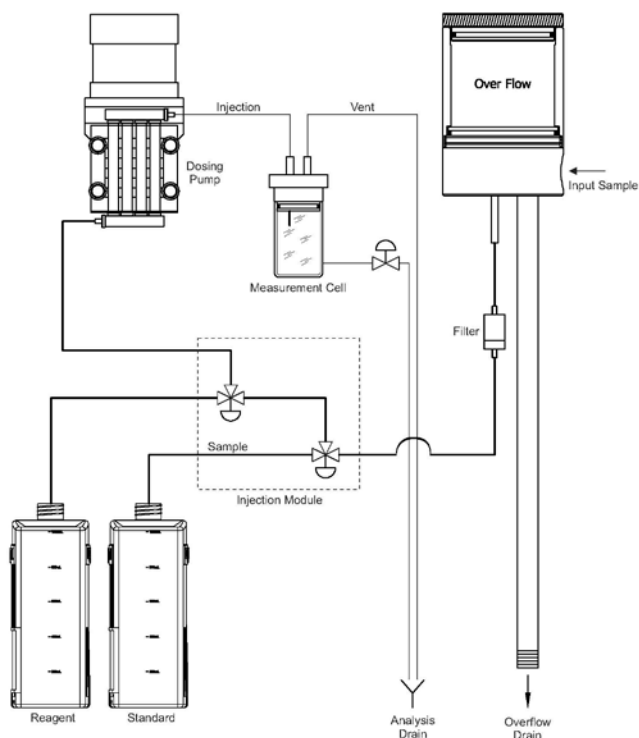
## SECTION 1 **Operating Principle**

### **Analyzer Operation**

Thermo Scientific™ Orion™ 2395 Phosphate Process Analyzer operates using a Flow Injection Analysis (FIA) system coupled with an optical sensor to measure ortho or reactive phosphate. Sample containing the reactive phosphate is initially mixed with a reagent consisting of ammonium molybdate in a strongly acidic medium. This produces a heteropoly acid complex known as vanadomolybdophosphoric acid. The yellow color formed by the molybdovanadate



phosphoric acid is proportional to the concentration of reactive phosphate.



In general, FIA involves the rapid injection of the sample under continuous flow. Sample is mixed with the reagent before entering the detection system.

During this process, the sample disperses and mixes with the reagent to form a homogenous solution, which is delivered to the measurement cell. Inside the measurement cell, the sample-reagent mixture is held until the reaction is complete and the absorbance signal is acquired. The reacted solution is displaced by the next sample entering the measurement cell. As the new sample-reagent mixture enters it rinses the cell to ensure there is no cross-contamination.

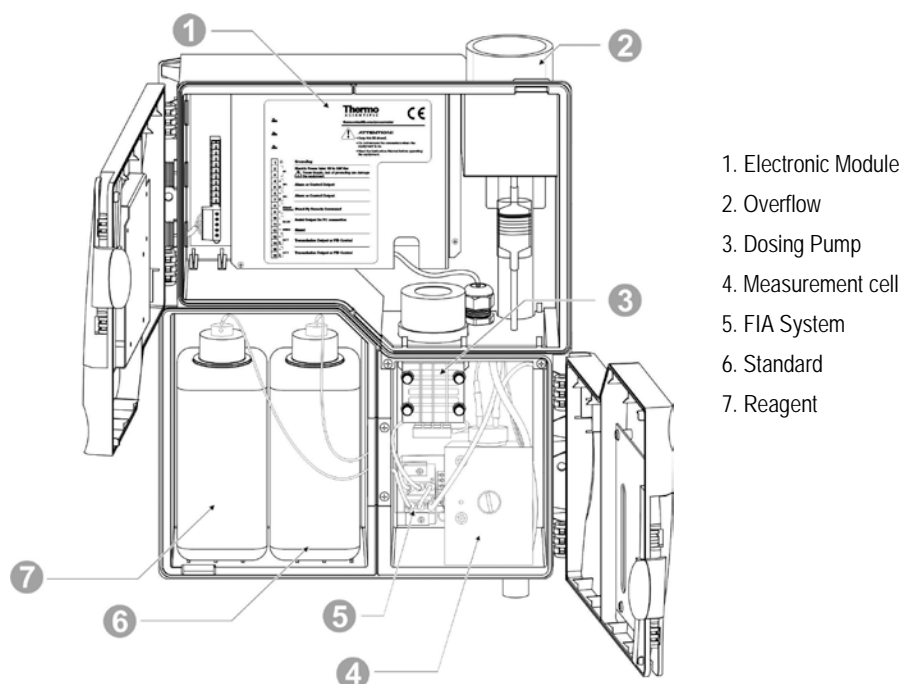
FIA is suitable for highly reproducible analyses with low reagent consumption, promoting a high sample throughput and minimizing contamination.

# 2

## SECTION 2 Analyzer Installation

### Mechanical Description

The analyzer consists of a durable light weight plastic cabinet, containing separate electronics and fluidics compartments. The enclosure is IP-56 rated with dimensions of 13.1 in x 16.3 in x 5.7 in (333 mm x 413 mm x 145 mm) and can be wall or panel mounted on a flat surface. The analyzer cabinet has three standardized 1/2" cable glands and terminal strips for connecting to a power source and communication cables.



## Installation Requirements

To ensure optimal performance of the Orion 2395 phosphate continuous analyzer, it is critical to install it correctly. The following steps must be followed:

1. **CAUTION:** In addition to the specific requirements listed in this manual, main power and product installation must be in accordance governing national, local electric codes and safety regulations.
2. After the removing the analyzer from the packaging, confirm that there is no damage resulting from transportation.
3. Follow the recommendations below:
  - a. Install the analyzer in an easily-accessible location, free of vibrations, smoke, corrosive fumes, water spray and chemical substances.
  - b. **CAUTION:** Direct sunlight may cause the internal temperature of the equipment to rise, risking damage to the analyzer and its reagents. We recommend using a protective covering with the analyzer.
  - c. **CAUTION:** Confirm the cable glands are dry and holding their respective interconnection cables tightly. Moisture will decrease the impedance, causing measurement errors. If there is a small gap, strap the cable with high-heat tape until you get a perfect grip on the cable gland. Never use silicone. This procedure will help preserve the protective characteristics of the housing (IP-56).
  - d. Periodically replace the O-ring seals to ensure a good seal in the housing. Make sure the lids are securely fastened, to ensure a good seal.

**WARNING:** Never install the analyzer near pumps or motors with industrial loads (source of electromagnetic discharge), or on the same network that feeds the motor. This may cause equipment malfunction or damage to the unit.

4. Proceed to connect the wiring from the power cord to the terminals using the Terminal Block Interconnection table on Page 9 and the Electrical Installation Wiring Diagram on Page 10.
5. Inspect all wiring to ensure the connections are correct.
6. Check that power supply is stable. The analyzer will only operate correctly on a voltage rating between 90 to 240 VAC (50/60Hz). Confirm that the correct voltage is being supplied.
7. The lack of proper grounding can cause serious damage to the equipment. The voltage between ground and neutral cannot exceed 5V. If it is above this threshold, there is bad ground or an unbalanced load. In this case, turn the circuit breakers on at the electric power switch panel after checking voltage between ground and neutral.



**WARNING:** The supply of control valves, solenoids, alarms and other components should be directly connected to the electrical panel and never on the same circuit as the analyzer (phase recovery).

**WARNING:** The power supply cables must be physically isolated with cable glands, separate from the other cables. Wiring for the 4-20mA and digital signals (RS-485) must be in a separate conduit. Solenoid cables must also be separated in their own conduit. If needed the solenoid and power cable may be placed through the same conduit.

## Terminal Block Interconnection

Posts	Connections
1	Grounding
2 and 3	Power supply 90 to 240 VAC (50/60Hz)
4 and 5	S1-Alarm or Control set point
6 and 7	S2-Alarm or Control set point
8 and 9	External control-Remote control for Stand-by
10,11 and 12	Digital communication output RS-485
13 and 14	Current output 4-20mA - Channel 1
15 and 16	Current output 4-20mA - Channel 2

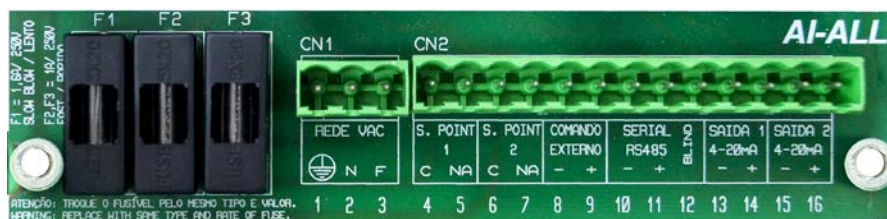
### Fuses

F1 = General (1.6 A / 250 V) - slow blow

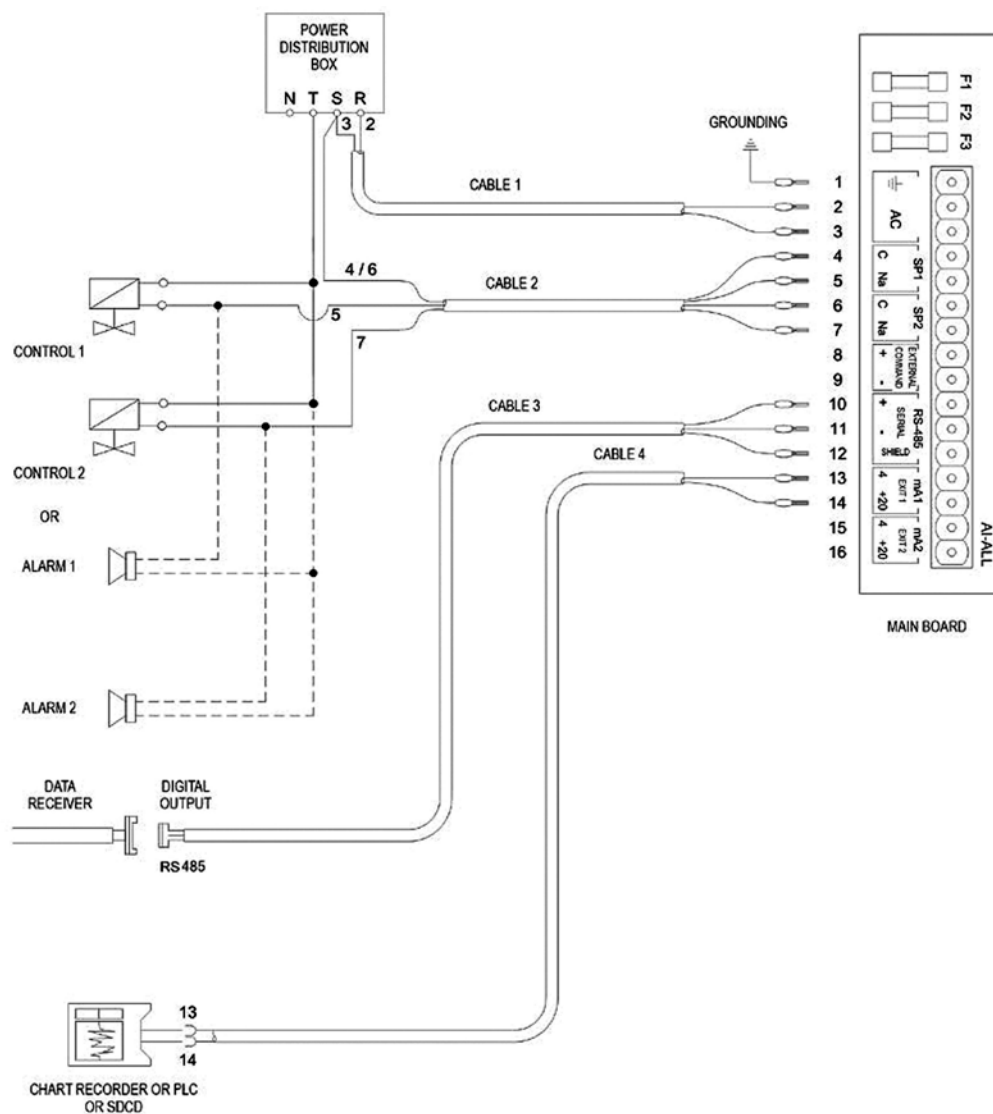
F2= Set. Point (SP1) - 1A/250 V - fast blow

F3= Set. Point (SP2) - 1A/250 V - fast blow

**NOTE:** The External Command (Terminal Posts 8 and 9) is used when the equipment needs to be placed in Stand-by (for example, in the case of a process interruption).



## Electrical Installation

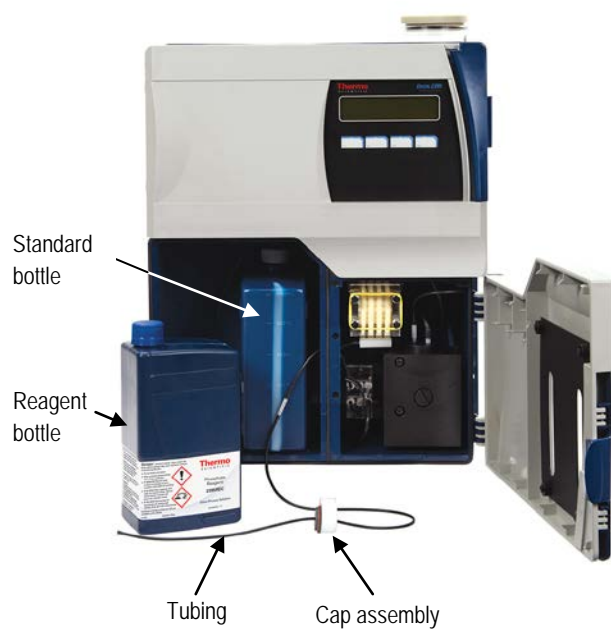


**NOTE 1:** It is important to use separate cables and phases for equipment and control valves or alarms.

**NOTE 2:** Cable shield 3 (terminal 12) should be installed on the terminal block connector only.

# 3

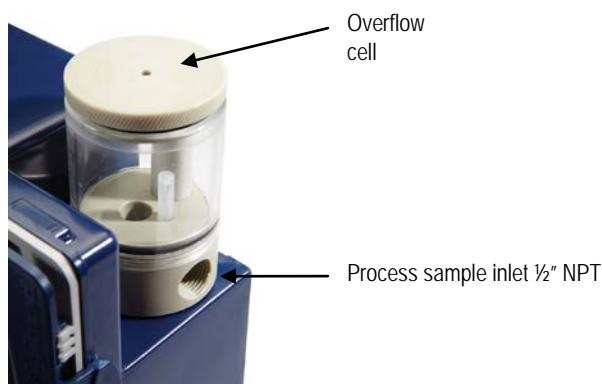
## SECTION 3 Initialization Steps



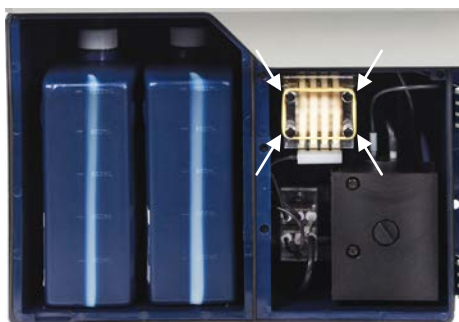
1. Install tubing at the overflow drain and a collector or funnel at the drain just below the analysis module. Leave the analysis drain and the overflow drain "open" to prevent back flow. The solution exiting through the overflow drain is pure process sample which can be returned to the process stream, if desired. Analysis flow rate is 40 mL per reading. The analysis drain must be discarded as it contains both process sample and reagents/residue.
2. Taking the reagent and standard bottles, remove each of the caps. Identify the tubing and cap assembly corresponding to the reagent and standard. Insert the tubing with check valve (white pieces at the ends of the hoses) into each respective bottle and tighten the caps.
3. Place the reagent and standard bottles in the analyzer reagent compartment.

**WARNING: DO NOT** invert the bottles.

4. Connect the process sample line to the sample inlet  $\frac{1}{2}$ " NPT fitting on the base of the Overflow cell. Confirm there are no leaks. Measure flow with a beaker at the over flow drain outlet. The sample flow should be 70 mL/minute.



5. Tighten the four screws on the dosing pump (they are shipped loose).



6. Make sure that the turbidity of the process does not exceed 20 NTU.
7. Connect the analyzer to electrical power. After startup the analyzer will show the date and time screen which will then proceed to the reading screen.

8. Access SETUP mode and configure the INDICATION menu options at analyzer menu (see page 16 – Configuring the analyzer).
9. Access SETUP mode and configure measure at analyzer menu (see page 16 – Configure the analyzer).
10. Access the SETUP mode and adjust transmission values (see page 18 - Configure Transmission).
11. Access reagents mode and refill hoses (see page 27–Reagents).
12. Let the analyzer acquire measurements for at least 2 hours.
13. Tighten the four screws on the dosing pump again.
14. Access to CALIBRATE mode and perform a manual calibration (see page 26 – Performing manual calibration).
15. The analyzer is ready for on-line analysis of sample.



# 4

## SECTION 4 **Menu Navigation**

### Turning the Analyzer On

Menus are designed for easy navigation and operation.

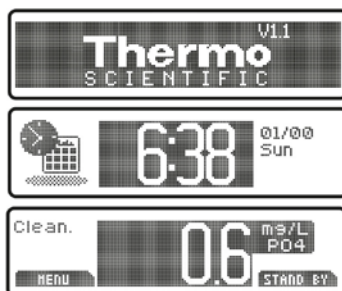
To enter or change data, the menu always provides flashing display options.

In order to access these options, press the **SELECT** and **ENTER** keys.

The **BACK** key is used to change options or correct unwanted data (it always returns to the previous menu options).

When powering up the analyzer, the model and revision of software are indicated on the display.

## Start Analyzer



Reading Screen  
Press the menu key to access configuration screen or standby key to put analyzer in stand-by mode

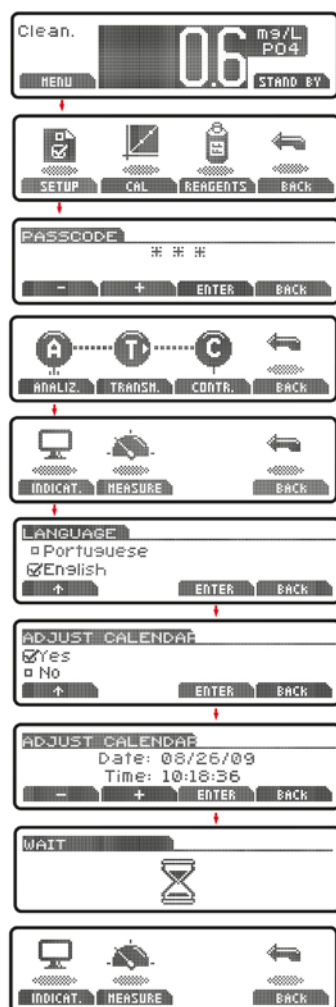
Note: During the menu navigation the analyzer continues to perform the measurement routine. Only if the analyzer is placed in STAND BY will the measurement routine stop.

Type passcode 220. Press and hold enter for 5 seconds to accept the password.

## Configuring the Analyzer

The configuration step allows preferences for the measurement to be selected. This includes preferred units, preferred parameter output, resolution, calibration point value as well as time between calibrations and analysis.

Setting up language, date and time:



Reading Screen

Configuration screen

Enter passcode 220 to access setup screen

Setup screen

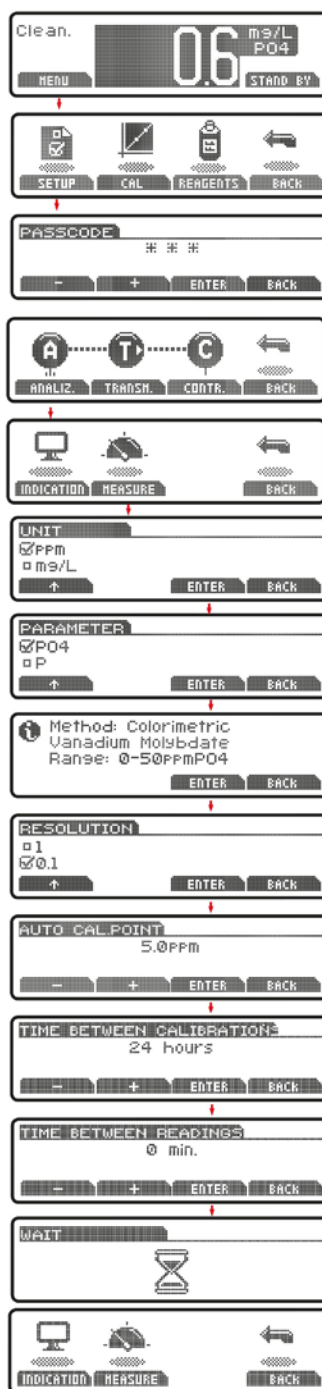
Press indicat. key

Select language

Adjust date and time



## Setting up Measurement Parameters



Reading Screen

Configuration screen

Enter passcode 220 to access setup screen

Setup screen

Press measure key

Select measure unit

Select measure parameter

Select measure resolution

Configure the standard - value between 5 to 50 ppm

Configure calibration frequency - time between 24 to 72 hours

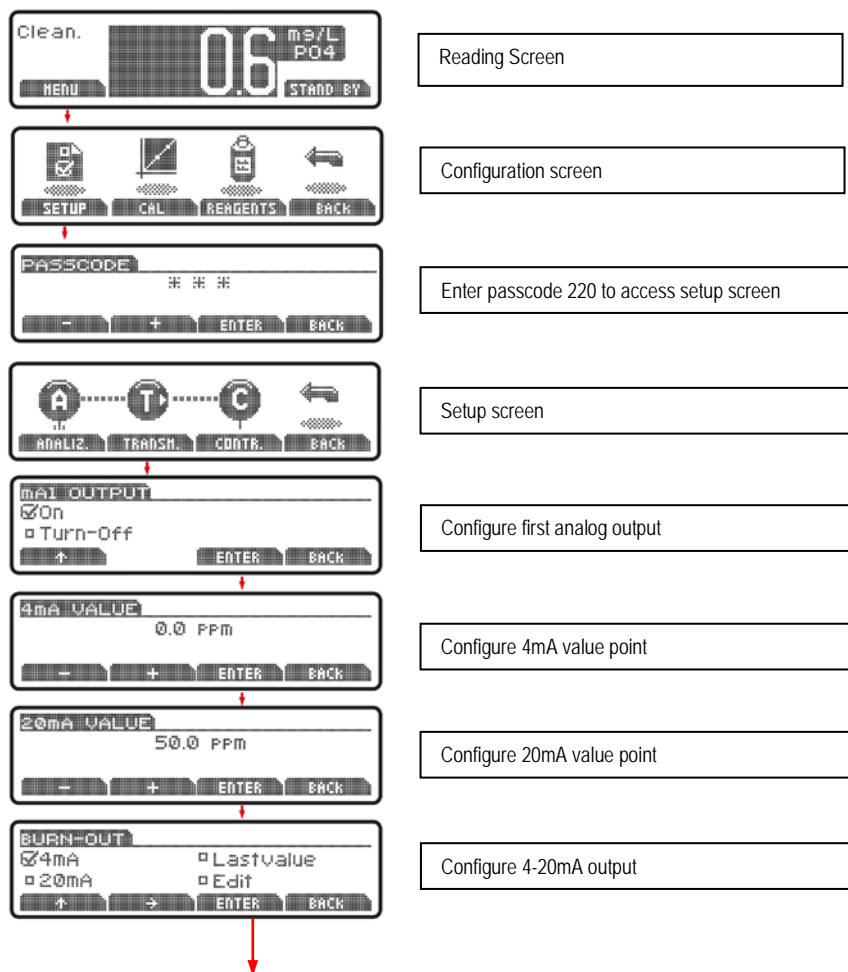
Configure period between each measure - time between 0 to 45 minutes

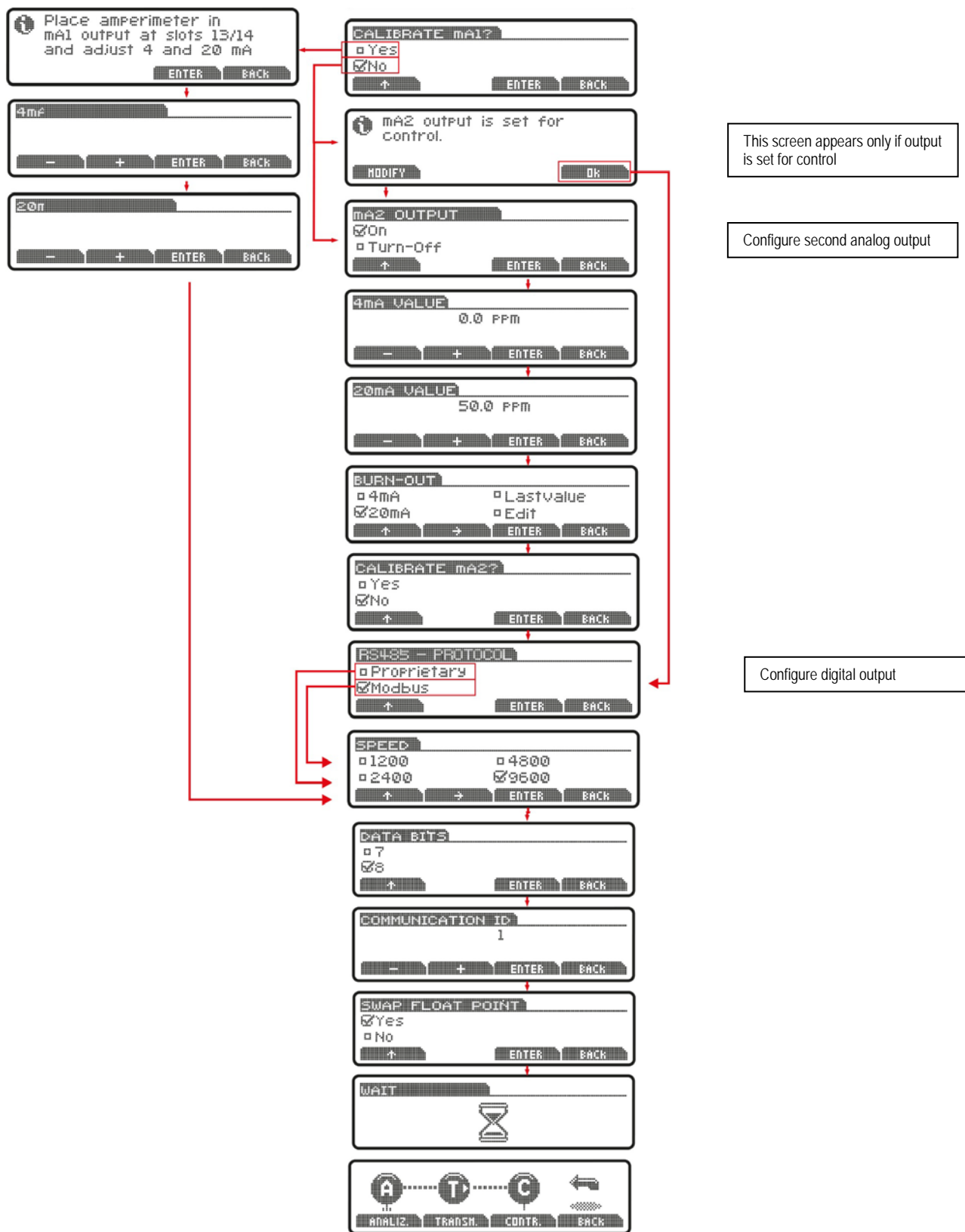
## Configuring Transmission

The transmission configuration section allows the analog outputs, and RS485 to be configured.

BURN-OUT function allows an analog output either 4mA or 20mA signal to be selected. During a failure mode the selected signal is transmitted to alert the control room of the analyzer status.

Swap float Point is used in MODBUS communication protocol to allow information in registers to be swapped for communication between the RS485 of the analyzer and the inlet of a PLC.

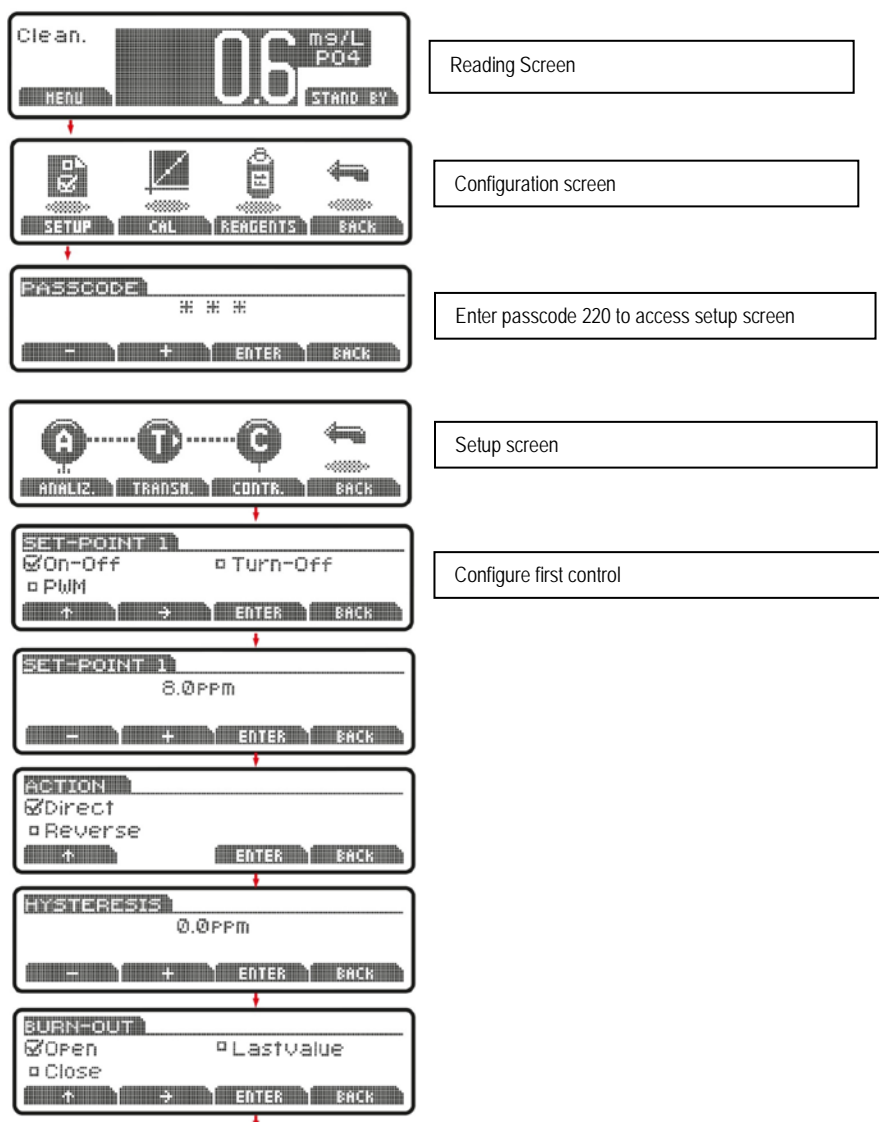


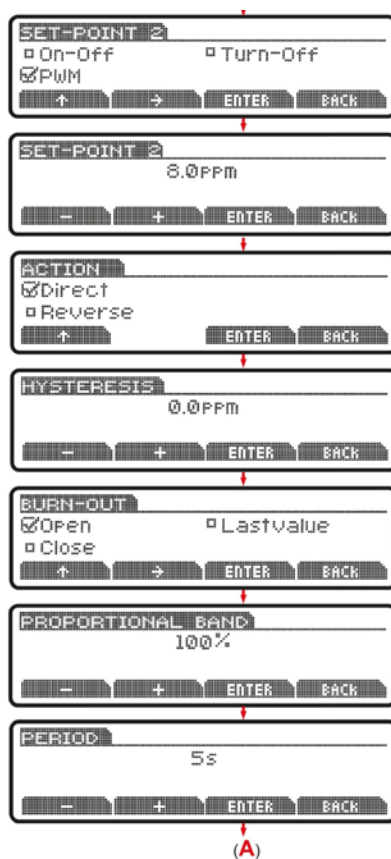


## Configuring Control Settings

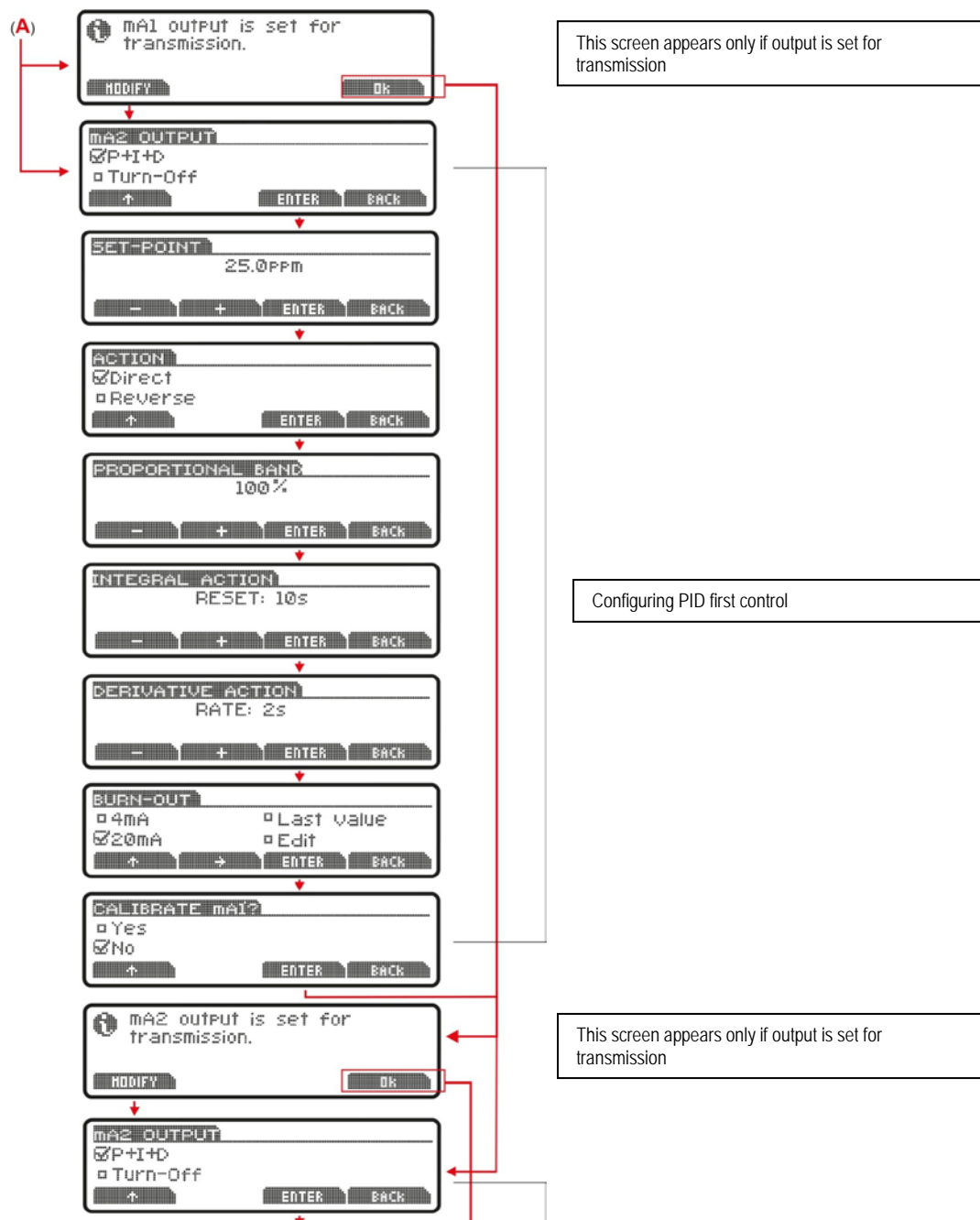
In control settings, the set point and Pulse Width Modulation (PWM) is configured.

Pulse Width Modulation, or PWM, is a technique for getting analog results in a digital mode. Digital control is used to create a square wave, a signal switched between on and off. This on-off pattern can simulate voltages in between full on (5 Volts) and off (0 Volts) by changing the portion of the time the signal spends on versus the time that the signal spends off. The duration of "on time" is called the pulse width. To obtain varying analog values, the pulse width can be changed, or modulated. Repeating this on-off pattern rapidly will result in a signal that appears as a steady voltage between 0 and 5v. This is a PWM signal.





Configure second control



SET-POINT  
25.0PPM  
- + ENTER BACK

ACTION  
☒ Direct  
☐ Reverse  
↑ ENTER BACK


PROPORTIONAL BAND  
100%  
- + ENTER BACK


INTEGRAL ACTION  
RESET: 10s  
- + ENTER BACK

DERIVATIVE ACTION  
RATE: 2s  
- + ENTER BACK

BURN-OUT  
☐ 4mA ☐ Last Value  
☒ 20mA ☐ Edit  
↑ → ENTER BACK

CALIBRATE mA2%  
☐ Yes  
☒ No  
↑ → ENTER BACK

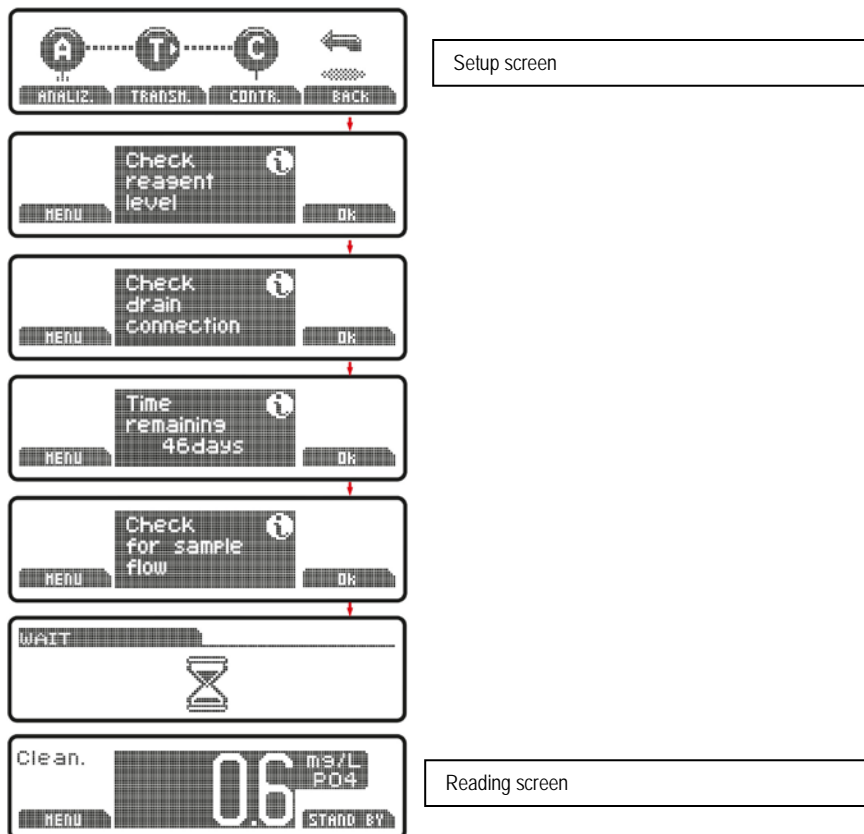
WAIT  


  
ANALIZ. TRANS. CONTR. BACK

Configuring PID second control

## Return to the Reading Screen

On completing the configuration procedure in the setup screen, the screen sequences below show the steps required to return to the Reading screen.





## Calibration Settings

The analyzer automatically monitors the reagent level. To set up, just enter the volume of the reagent bottle when replacing the bottle. After resetting, perform an auto calibration.

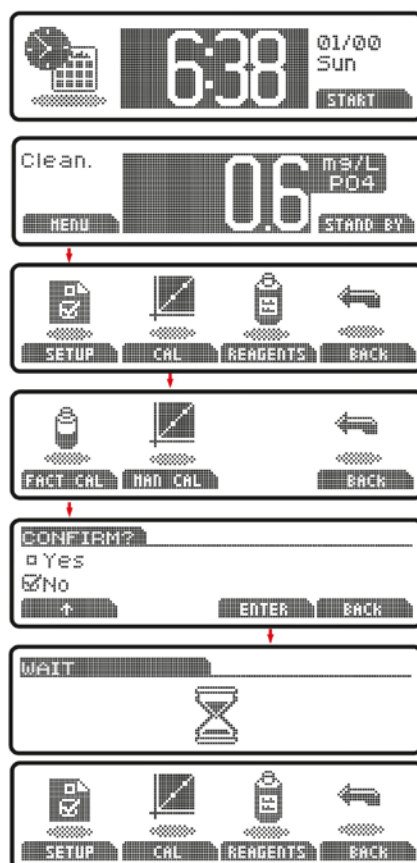
The accuracy of the equipment was determined by the standard deviation of measurements over the entire range specified. The accuracy of measurements was compared to previously prepared standards and used in the automatic calibration of the equipment. The standard to be used for calibration should be selected according to the range (see following table).

Working range	Calibration standard
0 to 10 ppm	5.0 ppm
10 to 30 ppm	20.0 ppm
30 to 50 ppm	40.0 ppm

For greater accuracy, calibrate the analyzer with the standard closest to the working range.

## Loading Factory Calibration

If there is a need to reset to the Factory Calibration, this may be selected through the "FACT CAL" option as shown below:



Reading Screen

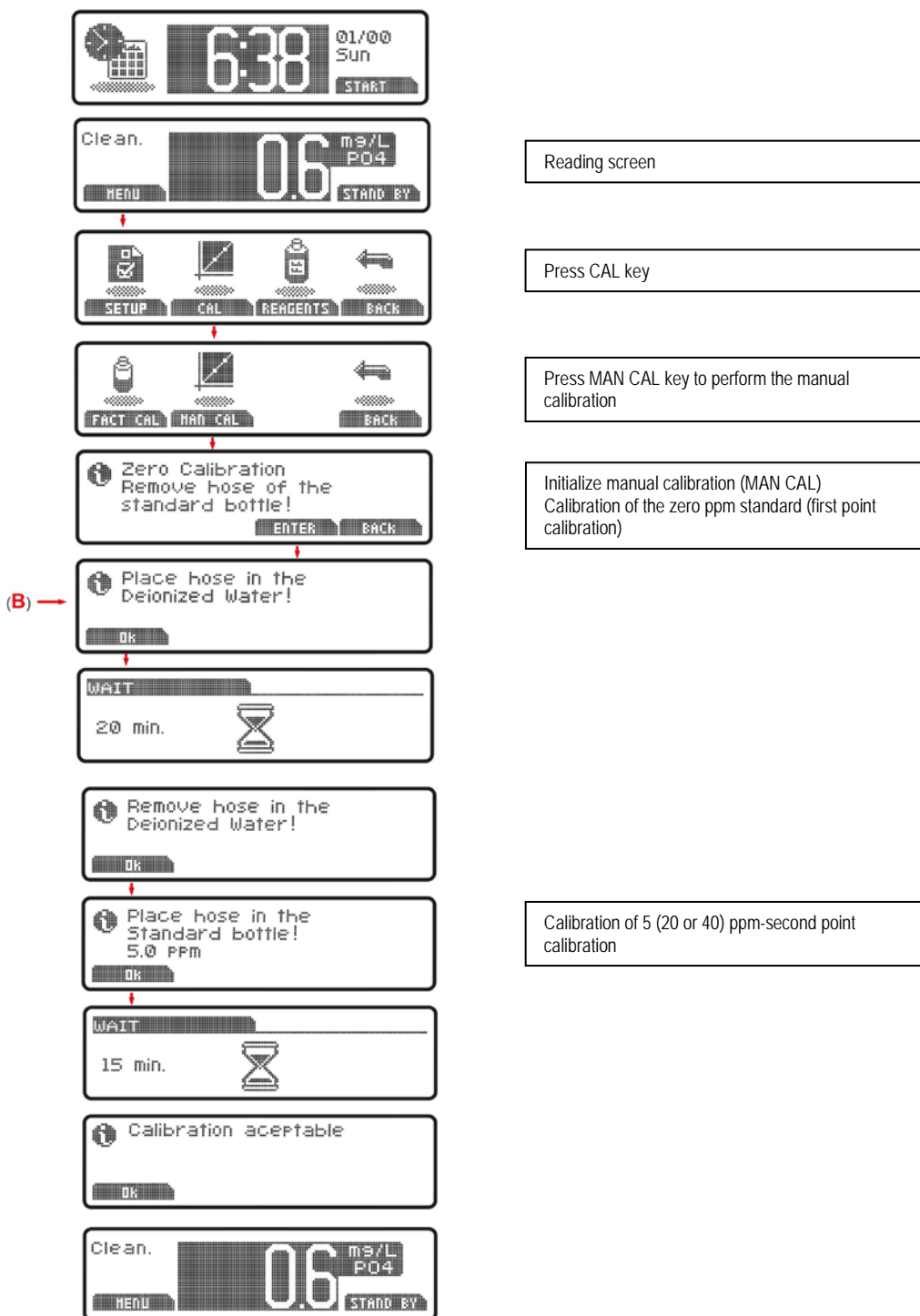
Press CAL key to select the calibration menu

Calibration mode  
Press FACT CAL key to load the factory calibration parameters

Confirm your choice  
YES to load the FACT CAL

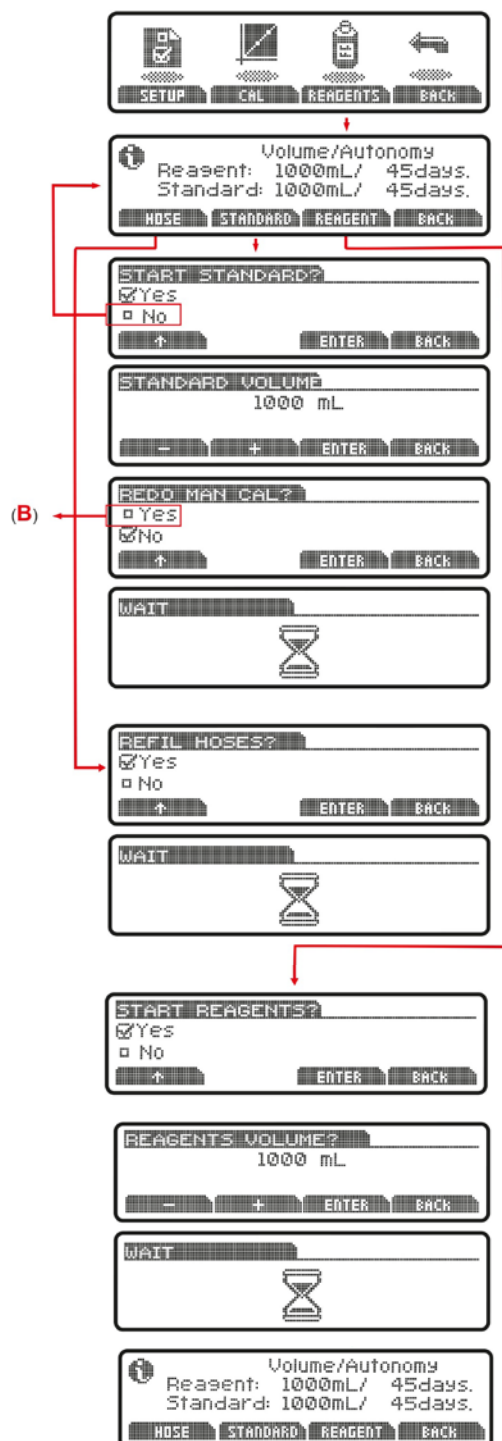
## Performing a Manual Calibration

If there is a need to calibrate, an auto-calibration or manual-calibration can be performed. The auto-calibration will only calibrate the selected calibration standard and is only for intercept adjustments. To adjust the intercept and slope a manual calibration is required. This requires both the "zero" and calibration standard. Use phosphate-free de-ionized water as standard "zero".



## Reagents

The analyzer automatically monitors the reagent level. To set up, enter the volume of the reagent bottle when replacing the bottle. After resetting, perform an auto calibration.



Configure reagent volume



# 5

## SECTION 5 Analysis Cycle Sequence

To verify an analysis cycle sequence, perform the following procedure:

1. Loosen the screw on the measurement cell cover. Lift and open the cover.



2. Access the READING screen on the analyzer display.
3. Check that the analysis cycle consists of the following steps:
  - a. Sample injection for the initial cleaning of reaction cell and subsequent drainage (indicated by the prompt "clean" in the reading screen)
  - b. Sample injection for the second cleaning of reaction cell and subsequent drainage (indicated by prompt "clean" in the reading screen)
  - c. Sample injection for determination of turbidity and subsequent drainage (indicated by the prompt "turb. Comp".)
  - d. Sample injection with a reagent for the determination of the ortho phosphate concentration (indicated by prompt "reading")
- Note:** If any of the steps a, b, c or d are missing, call your local Thermo Fisher Scientific office for technical assistance.
4. Close the measurement cell cover and tighten the screw.



# 6

## SECTION 6 Error Messages

When there is an analyzer error, the display will continually switch between a screen that shows the reading and another with an error message. The following are the possible messages:

**In Reading:**

Message on the display: Check Reagent  
When the REAGENT level is independently equal to or less than 5 days

Message on the display: Check Standard  
When the STANDARD level is independently equal to or less than 5 days.

Message on the display: Check-Calib. Factory outside limits  
When CALIBRATION FACTOR (point of auto-cal/value read)  $\leq 0.7$  or  $\geq 1.3$  (equal to an error  $\pm 30\%$  of reading).



Message on the display: Check Drain  
When a problem in the drain occurs, the analyzer will sense a problem due to the lack of change in the state for a long time while the reading is on.

**In Calibration:**

In REAGENTS option> STANDARD> START STANDARD

After injecting the standard from the new bottle, the analyzer will provide a prompt to repeat the MAN-CAL. The system will perform for the MAN-CAL process. If the calibration factor is outside the range of 0.7 to 1.3, the analyzer will display the following on the screen for 5 seconds: STANDARD AUTO OUTSIDE ACCEPTABLE LIMITS. Check STANDARD!

However, If the calibration factor differs up to  $\pm 15\%$  of standard calibration factor, the analyzer will accept the new calibration factor. Otherwise, if the calibration factor differs more than  $\pm 15\%$ , the instrument will display the following message on the screen for 5 seconds: STANDARD AUTO OUTSIDE ACCEPTABLE LIMITS. Check STANDARD!

In this case the analyzer will maintain the previous calibration and display the message "Check Calibration".



# 7

## SECTION 7 Preventative Maintenance

For proper operation of the equipment, the following preventative maintenance should be performed while wearing protective equipment:

### Semi-Annual Maintenance

1. Replace the o-ring seals and replace the hoses on the measurement system designed to prevent leakage risks to the system.
2. Clean overflow cell with a solution of hydrochloric acid (3.7%). Wear protective equipment during this procedure.
3. Clean particulate filter.

Refer to 2395MK6 maintenance sheet part number 271031 for details on performing 6 month maintenance.

### Annual Maintenance

Replace pinch rollers in dosing pump module.

Refer to 2395MK12 maintenance sheet part number 271032 for details on performing 12 month maintenance.

### Bi-Annual Maintenance

1. Change overflow cell.
2. Change particulate filter.

Refer to 2395MK24 maintenance sheet part number 271033 for details on performing 24 month maintenance.

## Maintenance schedule

The following maintenance schedule should be maintained based on a 6, 12, 18 and 24 month cycle. If the maintenance has exceeded 24 months then the cycle is repeated starting at 6 months.

Maintenance months	Maintenance consumables required
6	2395MK6
12	2395MK6+2395MK12
18	2395MK6
24	2395MK6+2395MK12+2395MK24

# 8

## SECTION 8 Troubleshooting

Symptom	Verify	Corrective Action
Equipment does not turn on	Fuse F1 open	Replace the fuse (equipment turned off)
	Supply of electrical power	Check circuit breaker at the electrical distribution box
	Pins 1, 2, 3 of CN-1 connector	Check connector (equipment turned off)
	Power input of the system	Measure outlet/breaker
	Power cord	Check that the cable is not broken, or that it is connected to the outlet
Calibration may be incorrect	Volume of the standard	Use new volume of the standard
	Validity of the standard solution or reagent	Use new volume of the standard
	Deteriorated standard solution or reagent	Use new volume of the standard
	White on sample	Perform calibration of white on the sample
	If the reference value in the configuration is correctly programmed	Perform configuration
Equipment is not reading correctly	Tubing	Replace tubing and seals
Serial port does not work	If the serial port is connected properly	Connect the system as instructed in the manual
	System configuration	Access menu and configure the RS-485 according to the manual
Control/Relay 4 to 20mA does not work	If the control/relay is connected	Connect the system as instructed in the manual

Symptom	Verify	Corrective Action
	System setup	Access the setup menu and select control/relay option if it is correctly configured
Set-Point 1 does not trigger or is in faulty condition	Setting (if Set-Point 1 was enabled)	Enable the Set-Point 1 by selecting settings in the menu and enable Set-Point 1
	Pins 6 and 7 of CN-1 connector	Check if cable wires are connected
	F2 fuse open	Replace the fuse
	Check if power is VAC and $I_{max}=1A$	See wiring manual. If $I > 1A$ , replace auxiliary relay
Set-Point 2 does not trigger or is in a faulty condition	Setting (if Set-Point 2 was enabled)	Enable the Set-Point 2 by selecting SETTING
	Pins 6 and 7 of CN-1 connector	Check if cable wires are connected
	F3 fuse open	Replace the fuse
	Check if power is VAC and $I_{max}=1A$	See wiring material (if $I > 1A$ , replace auxiliary relay)
Current output 1 of 4 - 20mA	Setting (if values were adjusted for 4 and 20mA for CN-1 posts 12 and 13)	Enable and adjust values for 4 to 20mA by selecting SETTING
	If the load is less than $850\Omega$	Correct by adjusting the load to $850\Omega$
Current output 2 of 4 - 20mA	Setting (if values were adjusted for 4 and 20mA for CN-1 posts 10 and 11)	Enable and adjust values for 4 to 20mA by selecting SETTING
	If the load is less than $850\Omega$	Correct by adjusting the load to $850\Omega$
Equipment is automatically restarted	Grounding	Check grounding connection
	Supply voltage out of specification	Regulate supply power for 90-240VAC.
Current output 1 and 2 are oscillating	If $\Delta$ between 4 to 20mA output is proportional to the oscillation due to a small range for the ppm scale selection for example 0-1ppm	Increase $\Delta$ between 4 and 20mA to a wider range for example 0-10ppm
Equipment is not reading the correct orthophosphate value	Check default value set	Verify the correct value
	Injection tubing	Replace tubing

# 9

## SECTION 9 Specifications

Product Specifications		
Measurement Performance	Measurement Range	0.2 to 50.0 ppm PO <sub>4</sub> <sup>3-</sup>
	Accuracy	5% or 0.1 ppm
	Resolution	0.1 ppm
	Response Time	15 minutes
	Precision	3% or 0.1 ppm
	Limit of Detection	0.2 ppm
	Method	Optical absorption at 460 nm
Environmental	Ambient Operating Temperature	5 to 45° C (41 to 113° F)
	Maximum Humidity	45 - 70% (sample temperature must not vary by more than 5° C)
Sample Requirements	Process Sample Flow	70 mL/min
	Sample Pressure	10 – 120 psi
	Sample Supply	Continuous
	Sample Temperature Range	15 to 45° C (59 - 113° F)
	Turbidity	< 20 NTU
	Sample Inlet/Outlet Connections	1/2 in OD flexible tubing - Polypropylene or similar material - Uses 1/2 inch NPT fitting to connect to “overflow” cell
	Drain	Use 1 inch tubing for drain fittings
	Sample Streams	One
Construction	Enclosure Integrity	IP-56

	Enclosure Dimensions (W x H x D)	13.1 in x 16.3 in x 5.7 in (333 mm x 413 mm x 145 mm)
	Shipping Weight	30.9 lbs (14 kg)
Electrical	Power Requirements	90 - 240V AC, 2.5 Watts, 50/60Hz
Data and Control	Current Loops	Two 4-20 mA. Maximum 850 ohm load
	Relays	2 contacts, 1A @ 250VAC
	Digital Communications	RS-485
Regulatory	Safety	CE: EN/IEC61010-1, cTUVus
	EMC	CE: EN61326

# 10

## SECTION 10 **Accessories and Spare Parts**

Part number	Description
2395REC	Phosphate analyzer reagent
239505	Phosphate analyzer standard, 5 ppm
239520	Phosphate analyzer standard, 20 ppm
239540	Phosphate analyzer standard, 40 ppm
2395MK6	Semi-annual maintenance kit-6 months
2395MK12	Annual maintenance kit-12 months
2395MK24	Biannual maintenance kit-24 months





# 11

## SECTION 11 Modbus Settings

The configuration requirements for the Modbus® communication protocol is provide in the table below:

Address	Variable	Type	Description	Configuration	R/W
0x0105	Language	Byte	Language	0 = Portuguese, 1 = English	R/W
0x010C	Resolution	Byte	Resolution	0 = 1, 1 = 0.1	R/W
0x010E	Substance	Byte	Substance	0 = P04, 1 = P	R/W
0x0110	Unit	Byte	Unit of measurement	0 = ppm, 1 = mg/L	R/W
0x012D	Tempo_auto_cal	Int	Time between auto calibrations	24 - 72	R/W
0x012F	Time_between_read	Int	Time between readings	0 - 45	R/W
0x016D	Standard	Float	Volume of the standard vial	1 - 2000	R/W
0x0175	Pt_cal_auto	Float	Point of auto-calibration	1 - 50	R/W
0x017D	Reagent	Float	Volume of the reagent vial	1 - 2000	R/W
0x0118	RS bits	Byte	RS stop bits	0 = 7, 1 = 8	R/W
0x0119	RS.parity	Byte	RS parity	0 = Even, 1 = Odd	R/W
0x011A	RS.protocol	Byte	RS protocol	0 = Owner, 1 = Modbus	R/W
0x011B	RS.swap_float_point	Byte	RS swap float point	0 = Yes, 1 = No	R/W
0x011C	RS.speed	Byte	RS speed	0 = 1200, 1 = 2400, 2 = 4800, 3 = 9600, 4 = 19200	R/W
0x0139	RS.network	Int	RS network	1 – 255	R/W
0x011D	mA.acao_pid [0]	Byte	Action	0 = Direct, 1 = Reverse	R/W
0x011E	mA.acao_pid [1]	Byte	Action	0 = Direct, 1 = Reverse	R/W

Address	Variable	Type	Description	Configuration	R/W
0x011F	mA.Burn_Out [0]	Byte	Burn-Out	0 = 4mA, 1 = 20mA, 2 = Last value, 2 = Custom	R/W
0x0120	mA.Burn_Out [1]	Byte	Burn-Out	0 = 4mA, 1 = 20mA, 2 = Last value, 2 = Custom	R/W
0x0121	mA.ON_OFF [0]	Byte	State	0 = P+I+D, 1 = Off	R/W
0x0122	mA.ON_OFF [1]	Byte	State	0 = P+I+D, 1 = Off	R/W
0x0123	mA.Tran_Cont [0]	Byte	Transmission or control	0 = Transmission, 1 = Control	R/W
0x0124	mA.Tran_Cont [1]	Byte	Transmission or control	0 = Transmission, 1 = Control	R/W
0x013B	mA.BP [0]	Int	Proportional band	1 - 1000	R/W
0x013D	mA.BP [1]	Int	Proportional band	1 - 1000	R/W
0x013F	mA.rate [0]	Int	Rate	1 - 1000	R/W
0x0141	mA.rate [1]	Int	Rate	1 - 1000	R/W
0x0143	mA.reset [0]	Int	Reset	1 - 1000	R/W
0x0145	mA.reset [1]	Int	Reset	1 - 1000	R/W
0x019D	mA.val_BO [0]	Float	Value of Burn-Out	4 - 20	R/W
0x01A1	mA.val_BO [1]	Float	Value of Burn-Out	4 - 20	R/W
0x01A5	mA.set_point [0]	Float	Set-Point mA1	0 - 50	R/W
0x01A9	mA.set_point [1]	Float	Set-Point mA2	0 - 50	R/W
0x01AD	mA.val_BO [0]	Float	Value of 4mA 1	0 - (mA.val_20 [0] - 0.1)	R/W
0x01B1	mA.val_BO [1]	Float	Value of 4mA 2	0 - (mA.val_20 [1] - 0.1)	R/W
0x01B5	mA.val_20 [0]	Float	Value of 20mA 1	(mA.val_4 [0] + 0.1) - 50	R/W
0x01B9	mAval20 [1]	Float	Value of 20mA 2	(mAval4 [1] + 0.1) - 50	R/W
0x0111	SP.action [0]	Byte	Set-point 1 action	0 = Direct, 1 = Reverse	R/W
0x0112	SP.action [1]	Byte	Set-point 2 action	0 = Direct, 1 = Reverse	R/W
0x0113	SP.Burn_Out [0]	Byte	Set-point 2 Burn-Out	0 = Open, 1 = Closed, 2 = Last value	R/W
0x0114	SP.Burn_Out [1]	Byte	Set-Point 1 Burn-Out	0 = Open, 1 = Closed, 2 = Last value	R/W
0x0115	SP. Type_control [0]	Byte	Set-Point 1 control type	0 = On-Off, 1 = PW, 2 = Off	R/W
0x0116	SP. Type_control [1]	Byte	Set-Point 2 control type	0 = On-Off, 1 = PW, 2 = Off	R/W
0x0131	SP.BP [0]	Int	Set-Point 1 proportional band	1 ~ 1000	R/W
0x0133	SP.BP [1]	Int	Set-Point 1 proportional band	1 ~ 1000	R/W
0x0135	SP.period [0]	Int	Set-Point 1 period	1 ~ 1000	R/W
0x0137	SP.period [1]	Int	Set-Point 2 period	1 ~ 1000	R/W
0x018D	SP.val_hist [0]	Float	Set-Point 1 hysteresis	0 ~ 50	R/W
0x0191	SP.val_hist [1]	Float	Set-Point 2 hysteresis	0 ~ 50	R/W
0x0195	SP.val_sp [0]	Float	Set-Point 1	0 ~ 50	R/W

Address	Variable	Type	Description	Configuration	R/W
0x0199	SP.val_sp [1]	Float	Set-Point 2	0 ~ 50	R/W
0x0125	clock.day	Byte	Clock day	1 ~ 31	R/W
0x0126	clock.month	Byte	Clock month	1 ~ 12	R/W
0x0127	clock.year1	Byte	Clock year1	0 ~ 99	R/W
0x0128	clock.year2	Byte	Clock year2	0 ~ 99	R/W
0x0129	clock.dow	Byte	Clock days of week	0 = Sun, 1 = Mon, 2 = Tue, 3 = Wed	R/W
0x012a	clock.hour	Byte	Clock hour	5      0 ~ 23      Fri	R/W
0x012B	clock.minute	Byte	Clock minute	0 ~ 59	R/W
0x012C	clock.second	Byte	Clock second	0 59	R/W
0x0500	tempo_auto_cal	long	Time left to AUTO-CAL		R
0x0550	Value of reading	float	Value of reading		R
0x0554	mV value	float	Value of temperature		R



# 12

## SECTION 12 **Procedure to Disconnect the Analyzer**

When you disconnect the analyzer (e.g., for maintenance), follow the steps below:

1. Make the last measurement with demineralized water, the reading will be equal to zero.
2. Remove the standard reagent bottle and replace with deionized water. Activate the feature fill hoses (MENU> REAGENTS> HOSE) repeat a second time.
3. Install funnel with deionized water, loosen the screws from the peristaltic pump and observe the drain (which should have stopped) without draining the water from the funnel.
4. Leave the unit on STANDBY and watch the drain, which should be discarding the water through the funnel.



# 13

## SECTION 13 **Customer Service**

### **Notice of Compliance**

This equipment generates uses and can radiate radio frequency energy. If not installed and used in accordance with the user guide, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference. The user, at his own expense, will be required to take the appropriate action to correct the interference.

"This digital apparatus does not exceed the (Class A) limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications."

## Declaration of Conformity

**Manufacturer:** Thermo Fisher Scientific Inc.

**Address:** 22 Alpha Road, Chelmsford, MA 01824, USA

**Hereby declares that the following products:**

Model Orion 2395 Phosphate Analyzer

**Conforms with the following directives and standards:**

**Safety:** Low Voltage Directive (LVD), 2006/95/EC

IEC61010-1:2001, Safety requirements for electrical equipment for measurement, control and laboratory use – general requirements

**EMC:** Electromagnetic Compatibility (EMC), 2004/108/EC

IEC/EN 61326-1:2005, Electrical equipment for measurement, control and laboratory use

This product has been manufactured in compliance with the provisions of the relevant manufacturing and test documents and processes. These documents and processes are recognized as complying with ISO 9001:2008 by QMI, listed as File #001911.



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Joanne Burke  
Quality & Compliance Engineer  
Regulatory Compliance

Place and Date of Issue:  
Chelmsford, MA  
April 27, 2015



## Terms and Conditions

For products not listed in this warranty statement, please visit our website at [www.thermo.com/processwater](http://www.thermo.com/processwater).

### Contact Information

For updated contact information, visit [www.thermo.com/contactwater](http://www.thermo.com/contactwater).

Thermo Fisher Scientific Inc.  
22 Alpha Road  
Chelmsford, MA 01824  
Toll Free: 800-225-1480  
Tel: 978-232-6000  
Dom. Fax: 978-232-6015  
Int'l Fax: 978-232-6031

### Minimum Order

The minimum order requirement is \$100 for Thermo Scientific Orion process products. An order is considered to be a purchase order for products to be shipped to a single location. International minimum order requirements may vary. Contact your international coordinator for details.

### Rush Orders

For customers in the U.S., rush orders received before 12 pm Eastern Time will be shipped the same day. Rush orders received after 12 noon Eastern Time will be shipped the next business day.

For customers and dealers in Canada, rush orders will be shipped within 2 business days. For customers and dealers outside the U.S. and Canada, contact your international coordinator for rush order scheduling. All rush orders carry a \$50 incremental charge per order. FOB: Beverly. Freight charges are prepaid and added or freight collect. All rush order processing is subject to stock availability.

### Returning Goods

Permission to return Thermo Scientific Orion products must be obtained prior to return. Contact us within 30 days of receipt of goods for a return authorization number.

## Hazardous Materials

Some materials are designated corrosive/oxidizer by DOT and IATA. Some materials may require special labeling and handling. Carriers may add additional freight charges for handling/transporting these materials. Consolidating such material with other products may be prohibited. Additional freight charges are billed to you per FOB terms. Advise manufacturer of shipping instructions for these hazardous materials to reduce your freight costs.

## Restocking Charge

Permission to return new, excess inventory must be obtained prior to return. If any item is authorized to be returned for credit as a result of an incorrect purchase without a reorder, a 25% restocking charge of the price paid for the product will be made. International customer's restocking fee of 25% will be off the international price.

Only new (in the box) goods may be returned within 30 days of shipment from manufacturer. Older items, 9 digit parts and discontinued items cannot be returned for credit.

## Short Shipments

Manufacturer must be notified within 30 days of receipt of invoice of any item or billing discrepancies. All substantiated claims will be remedied by a credit memo and a new order placed for short shipment. Any shipment discrepancy claimed after 30 days of invoice date will not be honored and credit will not be issued by manufacturer.

## Force Majeure

Manufacturer shall not be liable for failure to perform or for delay in performance due to fire, flood, strike, or other labor difficulty, act of God, act of any governmental authority or of the purchaser, riot, embargo, fuel or energy shortage, wrecks or delays in transportation, inability to obtain necessary labor, materials, or manufacturing facilities from usual sources, or due to any cause beyond its reasonable control. In the event of a delay in performance due to any such cause, the date of delivery or time for completion of performance will be extended by a period of time reasonably necessary to overcome the effect of such delay.

## Warranty

Thermo Scientific Orion process products are warranted to be free from defects in material and workmanship for a period of 12 months from date of installation or 18 months from date of shipment, whichever is earlier, when used under normal operating conditions and in accordance with the operating limitations and maintenance procedures given in the user

guide and when not having been subjected to accident, alteration, misuse or abuse. This warranty is also conditioned upon expendable and consumable items (diffusion tubing, electrodes and all solutions) being stored at temperatures between 5 °C and 45 °C (40 °F and 110 °F) in a non-corrosive atmosphere and within the shelf life printed on the product.

In the event of failure within the warranty period, the manufacturer or its authorized dealer will, at the option of manufacturer, repair or replace the product nonconforming to the above warranty or will refund the purchase price of the product.

The warranty described is exclusive and in lieu of all other warranties whether statutory, express, or implied including, but not limited to, any implied warranty of merchantability or fitness for a particular purpose and all warranties arising from the course of dealing or usage of trade. The buyer's sole and exclusive remedy is for repair or replacement of the nonconforming part thereof, or refund of the purchase price, but in no event shall the manufacturer (its contractors and suppliers of any tier) be liable to the buyer or any person for any special indirect, incidental, or consequential damages whether the claims are used in contract, in tort (including negligence), or otherwise with respect to or arising out of the product furnished hereunder.

Process products used at overseas nuclear facilities are also subject to the manufacturer's nuclear terms and conditions. Contact the manufacturer if you do not have a copy.

Representations and warranties made by any person, including its authorized dealers, distributors, representatives, and employees of the manufacturer, which are inconsistent or in addition to the terms of this warranty shall not be binding upon manufacturer unless in writing and signed by one of its officers.

[thermoscientific.com/processwater](http://thermoscientific.com/processwater)

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